



Original Article

Construct validity of the Parent–Child Sleep Interactions Scale (PSIS): associations with parenting, family stress, and maternal and child psychopathology



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ABSTRACT

Study objectives: Using a multi-method design, this study examined the construct validity of the Parent–Child Sleep Interactions Scale (PSIS; Alfano et al., 2013), which measures sleep-related parenting behaviors and interactions that contribute to preschoolers' sleep problems.

Methods: Participants included a community sample of 155 preschoolers (ages 3–5 years; 51.6% female). Primary caregivers completed the PSIS. Parenting styles and behaviors were assessed with laboratory observations and parent reports. Parent and child psychopathology and family life stress were assessed with clinical interviews and parent reports.

Results: Bivariate correlations revealed significant associations between the PSIS and a number of variables, including lower observed parental support and quality of instruction; higher observed parental intrusiveness; authoritative, authoritarian, and permissive parenting styles; current maternal depressive and/or anxiety disorders and depressive symptomatology; increased stressful life events; lower marital satisfaction; and higher child depressive, anxiety, attention-deficit/hyperactivity disorder (ADHD), and oppositional defiant disorder (ODD) symptoms. The patterns of association varied based on the specific PSIS scale.

Conclusions: The PSIS demonstrates meaningful associations with parenting, maternal psychopathology, family stress, and child psychopathology and functioning. Findings suggest that the PSIS is a valid measure for assessing sleep-related parent/child behaviors and interactions among preschoolers, suited to real-world settings.

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1. Introduction

Sleep problems in early childhood are common, affecting approximately 15–30% of preschool-aged children and are persistent over time into later childhood and adolescence [1,2]. A large body of research has established concurrent associations between early sleep problems and impairments across multiple domains, including cognitive and behavioral deficits, poor academic and social functioning, and decreased physical health [3–5]. Moreover, increasing evidence has linked early childhood sleep problems to difficulties with emotion regulation, internalizing and externalizing disorders, even in prospective, longitudinal studies [2,6–8]. Given the critical importance of adequate, restful sleep in early childhood, and its short- and long-term effects across multiple

domains of functioning, an understanding of the factors and mechanisms associated with children's disrupted sleep patterns is warranted and holds significance for both research and clinical practice.

Although bio-regulatory factors contribute to individual differences in sleep regulation, increasing research underscores the importance of children's social environments and family contexts in the development and maintenance of early childhood sleep problems [9]. One particularly important contextual factor in the development of sleep regulation is sleep-related parenting behaviors. For example, parental enforcement of children's regular bedtimes, consistency of bedtime routines, and parental encouragement of child sleep autonomy have been found to promote better sleep in children. By contrast, lax bedtime rules and limits, and greater parental over-involvement have been found to contribute to the development and maintenance of children's sleep-related problems (for a review, see Ref. [10]).

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Research has also linked sleep problems in children to environments characterized by parental psychopathology and high family stress [11–13]. For example, Warren and colleagues [14] found that anxious mothers were more overly involved in their children's bedtime routines compared to non-anxious mothers. Maternal depression and family disorganization (ie, lack of structure or routine setting) have been linked with greater sleep problems and anxiety in children [11]. In addition, emerging research has documented associations between family stress and increased night-waking and decreased sleep quality in children [13]. Within the family unit, stress and marital conflict are similarly connected to disrupted bio-regulatory mechanisms associated with sleep [15].

Despite the importance of considering parenting and family context in the development and maintenance of children's sleep problems, surprisingly little research has focused on these relationships during the preschool years. This empirical gap is particularly significant, as there are important developmental considerations during the preschool years. For example, key sleep-related issues among preschoolers include bedtime resistance, extended bedtime routines, co-sleeping, and requiring parent presence both for sleep onset and during night-wakings [16]. As preschoolers become more autonomous and develop self-regulatory behaviors, these years may be a critical period for parents to teach sleep hygiene and self-regulation. Understanding parent–child interactions and parenting styles in relation to the sleep process is paramount for addressing children's early sleep difficulties and would help provide targets for clinical intervention.

Although many measures examine the occurrence and frequency of sleep problems and disorders of initiating and maintaining sleep in children, limited measures consider the role of sleep-related parenting behaviors and interactions in children's sleep difficulties, such as bedtime reassurance, bedtime resistance, bed sharing, and praising self-regulatory behaviors (Parental Interactive Bedtime Scale (for infants) [17]), and none were developed for preschoolers. To address this critical need, the Parent–Child Sleep Interactions Scale (PSIS [18]), a brief 12-item parent-reported questionnaire appropriate for research, clinical, and pediatric settings, was developed to assess sleep-related parenting behaviors and interactions that may contribute to preschool sleep problems.

Alfano et al. [18] recently provided data on the factor structure and psychometric properties of the PSIS. A total composite PSIS scale and three PSIS subscales were derived: Sleep Reinforcement, Sleep Conflict, and Sleep Dependence. The Sleep Reinforcement subscale assesses parental reassurance and reinforcement of child sleep behaviors. The Sleep Conflict subscale assesses parent–child conflict and child noncompliance related to sleep. The Sleep Dependence subscale assesses problems with independent sleep (eg, child's inability to sleep without a caregiver or pre-bed rituals). PSIS total and subscale scores evidenced adequate internal consistency and were significantly associated with greater parent-reported and interviewer-rated sleep problems in children, as well as concurrent internalizing and externalizing problems. Interestingly, PSIS total and subscale scores also demonstrated expected associations with demographic variables, including child age, parental marital status, parental education, and race/ethnicity, consistent with the broader literature [18]. Overall, these findings provide initial support that the PSIS may be an effective tool for assessing parenting behaviors and parent–child interactions surrounding sleep.

In addition to acceptable convergent validity and reliability, further validation of the PSIS is necessary, as it remains unknown how the PSIS and its subscales relate to parenting behaviors and broader contextual aspects of child and family functioning. The current report aims to extend the initial validation of the PSIS by assessing the construct validity of the total PSIS and its subscales in a sample of preschoolers, using a multi-method (interviews, lab-

oratory assessments, and questionnaires) design. Our first aim was to examine associations between the total PSIS and its subscales and laboratory-based observations of parenting and parent-reported perceived parenting styles. Previous evidence has linked negative parenting styles characterized by lower support to poor sleep quality [19]. Thus, we hypothesized that PSIS scores would be positively associated with poorer/problematic parenting, such as lower support and higher intrusiveness. Given that previous research has also shown parental psychopathology and family stress to be associated with poorer quality of sleep in children, our second aim was to examine associations between the total PSIS and its subscales and maternal psychopathology and measures of family stress [13]. We hypothesized that PSIS scores would be significantly associated with maternal psychopathology, particularly anxiety and depressive disorders, and measures of family stress, including greater marital dissatisfaction and increased life stressors.

We also examined associations between the total PSIS and its subscales and children's concurrent symptoms of depression, anxiety, attention-deficit/hyperactivity disorder (ADHD), and oppositional defiant disorder (ODD), and measures of functional impairment in preschool-aged children. Child psychopathology and functional impairment were assessed with a structured diagnostic interview with parents. Previous studies have demonstrated significant associations between increased sleep problems and child psychopathology (for a review, see Ref. [20]). Although data remain limited, in this context, we hypothesized that there would be significant positive correlations between PSIS scores and symptoms of depression, anxiety, ADHD, ODD, and functional impairment.

2. Method

2.1. Participants

Participants were preschool-aged children and their parents, recruited as part of a larger study examining neuroendocrine function and risk for depression [21]. Potential participants were identified using a commercial mailing list (26.9%) and print advertisements distributed throughout local schools, daycares, community centers, and health-care providers in the greater Washington, DC area (73.1%). A proportion of flyers specifically targeted parents with a history of depression. Families with a child between 3 and 5 years of age who lived with an English-speaking biological parent, and who did not have significant medical conditions or developmental disabilities, were eligible for the study. Of the 175 families recruited for the larger study, one family did not speak or read English well enough to understand study tasks, and 19 families did not complete the PSIS measure, leaving a final sample of 155 preschool-aged children and their parents. Participants who completed the PSIS measure were compared to those who did not on parent, child, and demographic variables included in the study. There were three significant differences: participating parents were more likely to be married, $\chi^2(1, N = 173) = 4.38, p < .05$, and to evidence lower observed hostility and higher quality of instruction during a parent–child interaction task, than non-participating parents ($t(19.67) = -2.20, p = .04$; $t(20.22) = -2.46, p = .02$, respectively). The final sample of 155 preschool-aged children was also included as a subsample in the larger initial study on the factor structure and psychometric properties of the PSIS ($N = 209$ [18]). The study was approved by the human subjects review committee at the University of Maryland, and informed consent was obtained from parents.

The mean age of the children was 3.75 years ($SD = 0.76$); 75 (48.4%) were boys and 80 (51.6%) were girls. Children were of

average cognitive ability as measured by the Peabody Picture Vocabulary Test ($M = 110.67$, $SD = 15.44$, range = 68–148) (PPVT [22]). The mean ages of mothers and fathers were 34.87 years ($SD = 6.31$) and 37.19 years ($SD = 6.84$), respectively. Participating families were White/European American (41.9%), Black/African American (31.0%), Asian (1.9%), multiracial (9.0%), or other race/ethnicity (12.3%); 12.3% were Hispanic. The majority of children lived with two parents (69.0%) and had at least one parent with a 4-year college degree (69.7%).

Demographic characteristics of the study sample are presented in Table 1. Demographic variables (child age, gender, race/ethnicity, parents' age, marital status, education, and income) were highly interrelated. Specifically, parental age was significantly associated with race/ethnicity, income, marital status, and education; race/ethnicity was also significantly associated with income, marital status, and education; marital status was also significantly associated with income, and education; and education was also significantly associated with income (correlations ranged from $r = -.27$ to $r = .41$; all $p < .05$). No significant associations were observed for child age or gender. Thus, for the purposes of the study, child age, child gender, parental education, and race/ethnicity were utilized as covariates.

2.2. Measures

2.2.1. Demographics questionnaire

Parents completed a demographics questionnaire that included questions on race/ethnicity, age, marital status, yearly household income, and parental education.

2.2.2. Parent–child sleep interactions

Sleep-related parenting behaviors and interactions among children were assessed using the PSIS [18]. The PSIS is a 12-item parent-reported measure that assesses a wide range of bedtime behaviors and interactions among parents and their preschool-aged child associated with problematic sleep patterns in young children. Parents (93.5% mothers) rated each item on a 5-point Likert scale based on how frequently each bedtime behavior and interaction occurred in the past month (ie, “Never” to “Almost Always/Always”). Following Alfano et al., [18] items were summed to comprise the following scales: Sleep Reinforcement (eg, parental reassurance/reinforcement of child sleep behaviors; $M = 6.66$, $SD = 4.27$), Sleep Conflict (eg, conflict and child noncompliance surrounding sleep; $M = 4.01$, $SD = 2.98$), Sleep Dependence (eg, problems with independent sleep; $M = 4.77$, $SD = 3.87$), and PSIS total (eg, sum of all PSIS items; $M = 15.44$, $SD = 8.58$). All subscales and PSIS total demonstrated good internal consistency: Sleep Reinforcement (four items; $\alpha = .78$), Sleep Conflict (four items; $\alpha = .74$), Sleep Dependence (four items; $\alpha = .72$), PSIS total (12 items; $\alpha = .82$).

2.2.3. Parenting behavior

Children participated with the primary caregiver (93.5% mothers) in five structured parent–child interaction tasks adapted from the Teaching Tasks battery, including book reading, a guessing game, a maze, story sequencing, and tangram puzzles [23]. Interactions were videotaped and coded on 5-point scales for parental hostility (eg, expressions of anger, frustration, and criticism toward the child), parental support (eg, expressions of positive regard and emotional support), parental intrusiveness (eg, interference with child's needs, interests, or behaviors and efforts to gain autonomy), and parental quality of instruction (eg, ability to help child in understanding and structuring tasks coordinated with child's ability level); ratings were averaged across tasks. Parental hostility, support, intrusiveness, and quality of instruction showed good internal consistency ($\alpha = .88$, $.66$, $.76$, and $.83$, respectively) and

good interrater reliability (intraclass correlation coefficient (ICC) = .96, .91, .89, and .97, respectively, $n = 38$).

To assess perceived parenting style, parents (93.5% mothers) completed the Parenting Styles and Dimensions Questionnaire (PSDQ [24]). The PSDQ is a 37-item parent-reported measure with established reliability and validity, which assesses three styles of parenting: authoritative (high control and high warmth), authoritarian (high control and low warmth), and permissive (low control and high warmth). Factors demonstrated adequate internal consistency: authoritative (15 items, $\alpha = .79$), authoritarian (12 items, $\alpha = .70$), and permissive (5 items, $\alpha = .72$).

2.2.4. Maternal psychopathology

Mothers were interviewed using the Structured Clinical Interview for DSM-IV non-patient version (SCID-NP [25]). SCIDs were conducted by a master's level rater with extensive training in conducting SCID interviews. SCIDs were obtained from 153 (98.7%) mothers. Of the mothers, 10 mothers (6.5%) had a current (past month) depressive disorder, and 32 mothers (20.6%) had a current (past month) anxiety disorder. Current maternal depressive and anxiety disorder variables were collapsed into a single dichotomous variable (0 = no current depressive or anxiety disorder, 1 = current depressive and/or anxiety disorder): 40 mothers (26.3%) met criteria for a current depressive and/or anxiety disorder diagnosis. Based on 16 tapes, interrater reliability was excellent for current depressive disorder ($\kappa = 1.00$) and current anxiety disorder ($\kappa = 1.00$).

Parents (93.5% mothers) also completed the Diagnostic Inventory for Depression (DID [26]). The DID is a 22-item self-reported measure of current depressive symptoms, with higher scores representing greater depression severity. The measure demonstrated good internal consistency ($\alpha = .88$).

2.2.5. Family stress

To assess stressful life events, parents (93.4% mothers) completed a modified version of the Psychiatric Epidemiology Research Interview (PERI) Life Events Scale, a self-reported measure of stressful life events occurring over the past year [27]. Parents were asked whether they had experienced any of 31 major life events (eg, lost a home, physical illness, separation or divorce, or parental arrest) in the past year and the date of the event. Major life events were scored for absence or presence, and a total major life stress score was computed by summing the total number of experienced stressful life events in the past year ($M = 2.97$, $SD = 3.45$, range = 0–20; $\alpha = .95$).

Parents also completed the Dyadic Adjustment Scale (DAS [28]). The DAS is a 32-item measure of marital satisfaction, designed for use with married or unmarried couples ($M = 112.52$, $SD = 22.21$, range = 0–142; $\alpha = .95$). It was completed by 135 parents (92.6% mothers). Scores on the DAS range from 0 to 151, with higher scores reflecting greater marital satisfaction.

2.2.6. Child psychopathology and functioning

Parents (92.9% mothers) were interviewed using the Preschool Age Psychiatric Assessment (PAPA; Version 1.4 [29]). The PAPA is a semi-structured parent-reported interview that assesses a comprehensive range of symptoms from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR [30]) in preschoolers aged 2–6 years.

Interviews were conducted by advanced graduate students in clinical psychology supervised by a PhD-level, licensed clinical psychologist with extensive experience and training in the PAPA. Dimensional symptom scales for depression (major depressive disorder, dysthymia, or depression not otherwise specified [NOS]) ($\alpha = .60$), anxiety (specific phobia, separation anxiety, social phobia, generalized anxiety disorder, agoraphobia, panic disorder,

Table 1

Demographic and clinical characteristics of the study sample (N = 155).

Demographic variable	% (N)	M (SD)	Min	Max
Child age: years		3.75 (0.76)	3.00	5.00
Mother age: years		34.87 (6.31)	21.00	50.00
Father age: years		37.19 (6.84)	20.00	57.00
Child gender: female	51.6 (80)			
Child race/ethnicity				
White/non-Hispanic	41.9 (65)			
Black/African American	31.0 (48)			
Hispanic	12.3 (19)			
Asian	1.9 (3)			
Multiracial	9.0 (14)			
Other	12.3 (19)			
Parents' marital status				
Married	69.0 (107)			
Divorced, separated, or widowed	7.1 (11)			
Never married	23.9 (37)			
Parental education: ≥ 1 parent college graduate	69.7 (108)			
Income				
<\$20,000	7.1 (11)			
\$20,001–\$40,000	9.7 (15)			
\$40,001–\$70,000	20.0 (31)			
\$70,001–\$100,000	26.5 (41)			
>\$100,000	33.5 (52)			
Parenting				
Observed parental support		4.12 (0.74)	1.80	5.00
Observed parental intrusiveness		1.59 (0.51)	1.00	3.20
Observed parental hostility		1.14 (0.29)	1.00	2.60
Observed parental quality of instruction		3.78 (0.85)	1.60	5.00
Parent-reported PSDQ authoritative		61.22 (6.75)	34.75	75.00
Parent-reported PSDQ authoritarian		20.10 (4.47)	13.00	36.00
Parent-reported PSDQ permissive		10.65 (3.29)	5.00	23.00
Parental psychopathology (current)				
Maternal depressive and/or anxiety disorder	26.3 (40)			
Parent self-reported depressive symptoms ^a		6.82 (6.91)	0.00	37.00
Family stress				
Life stressors in the past 12 months		2.97 (3.45)	0.00	20.00
Marital adjustment		112.52 (22.21)	0.00	142.00
Child psychopathology and functioning				
PAPA depressive symptoms		3.46 (2.58)	0.00	14.00
PAPA anxiety symptoms		12.55 (8.06)	0.00	55.00
PAPA ADHD symptoms		2.34 (3.42)	0.00	17.00
PAPA ODD symptoms		4.51 (2.88)	0.00	14.00
PAPA impairment ratings (0–4)		0.98 (0.53)	0.00	2.80
Children's global assessment of functioning (1–100)		72.32 (14.04)	35.00	100.00

Note: Categorical variables are presented as frequency and percentage; continuous variables are presented as mean and standard deviation. PSIS = Parent–Child Sleep Interactions Scale; PSDQ = Parenting Styles and Dimensions Questionnaire; PAPA = Preschool Age Psychiatric Assessment.

^a Assessed using the Diagnostic Inventory for Depression (DID).

and selective mutism) ($\alpha = .81$), ADHD ($\alpha = .71$), and ODD ($\alpha = .71$) were created by summing items in each diagnostic category. Based on 15 interviews, interrater reliability was good for the depression, anxiety, ADHD, and ODD scales (ICC = .89, .97, .94, and .87 respectively).

2.2.7. Child functional impairment

Following the PAPA, the interviewer completed functional impairment ratings across multiple domains (eg, daycare/school life, household and recreational activities, parental relationship quality, sibling relationships, and peer relationships) on a 5-point impairment scale (0 = very good functioning/no impairment; 4 = very poor functioning/severe impairment). Ratings were averaged to yield a composite index of children's impairment ($\alpha = .74$; ICC = .88, $n = 15$), with higher scores reflecting greater functional impairment ($M = 0.98$, $SD = 0.53$, range: 0–2.80). The interviewer also completed the Children's Global Assessment Scale (CGAS), a global measure of children's overall level of psychosocial functioning [31]. CGAS scores range from 0 to 100, where 0 reflects the worst functioning and 100 reflects superior functioning ($M = 72.32$, $SD = 14.04$, ICC = .78).

2.3. Data analysis plan

To assess the construct validity of the PSIS, bivariate correlations were conducted between PSIS total and subscales and variables from the following domains: parenting, maternal psychopathology, family stress, and child psychopathology and functioning. Pearson correlations were computed between PSIS scores and continuous variables. Point-biserial correlations were computed between PSIS scores and dichotomous variables. As these are relatively novel data, we report findings both with and without correction for multiple comparisons, although we emphasize the former in interpreting findings. To adjust for multiple comparisons within each domain, we used the Benjamini and Hochberg [32] procedure.

To determine which variables had unique associations with PSIS total and its subscales, we conducted separate multivariate linear regression models, with PSIS total or subscales entered as dependent variables, and variables with significant bivariate associations (specific to the scale) entered as independent variables. Tests of tolerance values to detect multicollinearity were conducted for all multivariate models. Tolerance values for all variables in the

multivariate PSIS Sleep Reinforcement model exceeded 0.70, indicating an acceptable degree of multicollinearity among the variables [33]. For the PSIS Sleep Conflict, PSIS Sleep Dependency, and PSIS Total models, all tolerance statistics exceeded 0.70, with the exception of a few variables. However, results were similar when these variables were excluded.

3. Results

3.1. Associations between demographic, independent variables, and PSIS

Table 2 shows the Pearson and point-biserial correlation coefficients between demographic variables (ie, child age, gender, parental education, and race/ethnicity) and variables from the following domains: parenting, maternal psychopathology, family stress, and child psychopathology and functioning. Child age was significantly negatively associated with laboratory observations of parental intrusiveness, and significantly positively associated with parental quality of instruction. Child gender (0 = male, 1 = female) was significantly negatively associated with ADHD symptoms and PAPA impairment ratings, and significantly positively associated with CGAS scores. Parental education was significantly associated with all parenting variables with the exception of parent-reported authoritative parenting style, and was significantly negatively associated with current maternal depressive and/or anxiety disorders. As seen in Table 2, there were also several racial/ethnic differences among study variables, which were previously discussed in Alfano et al. [18]. In addition, for a detailed discussion of the associations between demographic variables and the PSIS scales, see Alfano et al. [18].

3.2. PSIS and parenting

Table 3 shows the Pearson correlation coefficients of PSIS total and subscales with laboratory observations of parental hostility, support, intrusiveness, and quality of instruction, and parent-reported measures of authoritative, authoritarian, and permissive parenting styles. The PSIS Sleep Reinforcement subscale was significantly positively associated with PSDQ authoritative parenting style. The PSIS Sleep Conflict subscale was significantly positively associated with PSDQ permissive parenting style, and negatively associated with observed parental quality of instruction and PSDQ authoritative parenting style. The PSIS Sleep Dependence subscale was significantly positively associated with observed parental intrusiveness, PSDQ authoritarian, and PSDQ permissive parenting styles, and significantly negatively associated with observed parental support and quality of instruction. The PSIS total score was significantly positively associated with observed parental intrusiveness and PSDQ permissive parenting style, and significantly negatively associated with observed parental quality of instruction. No significant associations were observed for laboratory observations of parental hostility. All significant associations remained significant after correcting for multiple comparisons.

3.3. PSIS and maternal psychopathology and family stress

Table 4 shows the correlations of PSIS total and subscales with interviewer-rated and self-reported maternal psychopathology and measures of family stress. The PSIS Sleep Dependence subscale was associated with significantly higher rates of current maternal depressive and/or anxiety disorders, greater self-reported current depressive symptomatology, and more life stressors in the past year. The PSIS Sleep Conflict subscale was significantly associated with lower marital satisfaction. The PSIS total score was significantly

associated with greater maternal depressive symptomatology and more life stressors in the past year. No significant associations were observed for the PSIS Sleep Reinforcement subscale. All significant associations remained significant after correcting for multiple comparisons.

3.4. PSIS and child psychopathology and functioning

Table 5 shows the Pearson correlation coefficients of PSIS total and subscales with child depressive, anxiety, ADHD, and ODD symptoms, and functional impairment. The PSIS Sleep Reinforcement subscale was significantly associated with higher depressive symptoms. The PSIS Sleep Conflict subscale was significantly associated with higher depressive, anxiety, ADHD, and ODD symptoms, as well as higher PAPA impairment ratings and lower CGAS scores. The PSIS Sleep Dependence subscale was significantly associated with higher depressive symptoms. Lastly, PSIS total score was significantly associated with higher depressive and anxiety symptoms. These associations remained significant after correcting for multiple comparisons, with the exception of the association between the PSIS Sleep Conflict subscale and PAPA impairment ratings, which became significant at the trend level (adjusted $p = .05$).

3.5. Multivariate analyses

For PSIS total and each subscale, variables with significant bivariate associations specific to each scale were entered into a multivariate linear regression model to determine which variables demonstrated unique associations with the scale. Results from multivariate analyses are presented in Table 6. PSDQ authoritative parenting style and child depressive symptoms made significant unique contributions to the PSIS Sleep Reinforcement subscale; PSDQ authoritative parenting style and child depressive and anxiety symptoms made significant unique contributions to the PSIS Sleep Conflict subscale; PSDQ permissive parenting style made a significant unique contribution to the PSIS Sleep Dependence subscale; lastly, observed parental quality of instruction, PSDQ permissive parenting style, and child depressive symptoms made significant unique contributions to the PSIS total score.

3.6. Demographic covariates

In order to determine whether the results were driven by demographic variables, we included demographic variables (ie, child age, gender, parental education, and race/ethnicity) in all multivariate models. Results were similar even after controlling for all demographic variables.

4. Discussion

Our current findings extend evidence for the utility of the PSIS [18] through demonstration of its construct validity in a community sample of preschool-aged children. We found that PSIS scores converged with poorer parenting behaviors and styles, greater parental psychopathology, increased family stress, and increased symptoms of child psychopathology and poorer functioning. These results persisted even after correcting for multiple comparisons within domains, with the exception of PAPA impairment ratings, which became significant at the trend level. Specific patterns of association varied based on the different PSIS scales, and small-to medium-effect sizes were observed. Our results therefore also provide some insight into the specific mechanisms linking sleep-related parenting behaviors/interactions with preschoolers' sleep problems.

Table 2Intercorrelation table of demographic and independent variables.^a

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1. Child age	–	–.07	.08	–.02	.07	.01	–.07	.11	–.18*	–.08	.31**	.05	.02	–.14	–.04	.06	.02	.00	.10	–.13	–.02	.02	.02	–.03
2. Child gender		–	.09	.01	.11	–.07	–.09	–.10	–.02	–.03	–.03	.05	–.14	–.08	–.02	–.05	.00	.08	.03	.13	–.18*	–.14	–.23**	.17*
3. Parental education			–	.32**	–.24**	–.21**	.09	.37**	–.35**	–.26**	.46**	.06	–.22**	–.27**	–.28**	–.08	–.15	.12	.05	–.02	–.11	.07	–.05	–.02
4. White/non-Hispanic				–	–.55**	–.36**	–.32**	.31**	–.32**	–.26**	.32**	.03	–.12	–.26**	–.02	–.10	–.22**	.24**	–.14	–.16*	–.18*	.03	–.06	.06
5. Black/African-American					–	–.29**	–.25**	–.33**	.31**	.27**	–.32**	–.02	.09	.18*	.12	–.02	.13	–.27**	.05	.05	.00	–.14	.02	.02
6. Hispanic						–	–.17*	–.09	.05	–.01	–.07	.06	–.00	.01	–.12	.07	.06	.05	.04	.08	.05	–.02	.01	–.01
7. Other race/ethnicity							–	.10	–.01	.02	.04	–.08	.05	.13	–.01	.10	.07	–.06	.09	.08	.20*	.17*	.05	–.10
8. Observed parental support								–	–.54**	–.59**	.79**	–.01	–.09	–.12	–.11	–.01	–.15	.15	–.03	–.07	.03	.07	–.01	.03
9. Observed parental intrusiveness									–	.49**	–.67**	.05	.09	.15	.10	–.04	.28**	–.17*	.08	.16*	.10	.01	.13	–.18*
10. Observed parental hostility										–	–.46**	–.03	.16*	.19*	.04	.00	.16	–.13	.03	.02	.11	–.04	.07	–.08
11. Observed quality of instruction											–	.03	–.12	–.17*	–.19*	–.03	–.24**	.19*	–.02	–.10	–.01	.01	–.04	.06
12. Parent-reported PSDQ authoritative												–	–.32**	–.17*	–.02	–.08	–.03	.28**	.05	.00	–.02	–.05	–.12	.07
13. Parent-reported PSDQ authoritarian													–	.38**	.05	.17*	.08	–.10	.05	.00	.04	.24**	.20*	–.21**
14. Parent-reported PSDQ permissive														–	.09	.09	.09	–.15	.19*	.21*	.11	.23**	.28**	–.23**
15. Maternal depressive and/or anxiety disorder															–	.21**	.14	–.03	.12	.10	–.04	.01	.07	–.07
16. Parent self-reported depressive symptoms																–	.15	–.33**	.21*	.08	.10	.14	.15	–.24**
17. Life stressors in the past 12 months																	–	–.15	.23**	.08	–.08	.11	.07	–.18*
18. Marital adjustment																		–	–.08	–.12	–.19*	–.10	–.22*	.23**
19. PAPA depressive symptoms																			–	.39**	.42**	.56**	.52**	–.65**
20. PAPA anxiety symptoms																				–	.36**	.11	.33**	–.47**
21. PAPA ADHD symptoms																					–	.29**	.37**	–.47**
22. PAPA ODD symptoms																						–	.51**	–.62**
23. PAPA impairment ratings																							–	–.76**
24. CGAS																								–

Note: Values represent Pearson correlations for continuous variables, and point-biserial correlations for dichotomous variables. PSDQ = Parenting Styles and Dimensions Questionnaire; PAPA = Preschool Age Psychiatric Assessment; CGAS = Children's Global Assessment of Functioning.

^a For associations between demographic variables and PSIS scales, see Alfano et al. [18].

* $p < .05$.

** $p < .01$.

Table 3

Correlations between the Parent–Child Sleep Interactions Scale and measures of parenting.

	PSIS scales			
	Sleep Reinforcement	Sleep Conflict	Sleep Dependence	PSIS total
Parenting				
Observed parental support ^a	-.07	-.08	-.18*	-.14 [†]
Observed parental intrusiveness ^a	.08	.13	.19*	.17*
Observed parental hostility	.02	.11	.14 [†]	.11
Observed parental quality of instruction ^a	-.12	-.18*	-.27***	-.25**
Parent-reported PSDQ authoritative ^a	.31***	-.21**	-.06	.06
Parent-reported PSDQ authoritarian ^a	-.11	.06	.20*	.05
Parent-reported PSDQ permissive ^a	.09	.26***	.41***	.32***

Note. Values represent zero-order Pearson correlation coefficients. PSIS = Parent–Child Sleep Interactions Scale; PSDQ = Parenting Styles and Dimensions Questionnaire.

[†] $p < .10$.* $p < .05$.** $p < .01$.*** $p < .001$.^a Remained significant after Benjamini and Hochberg's [32] procedure to correct for multiple comparisons within domains was employed; all adjusted $p < .03$.**Table 4**

Correlations between the Parent–Child Sleep Interactions Scale, parental psychopathology and family stress.

	PSIS scales			
	Sleep Reinforcement	Sleep Conflict	Sleep Dependence	PSIS total
Parental psychopathology (current)				
Maternal depressive and/or anxiety disorder ^{a,b}	.08	.05	.22**	.16 [†]
Parent self-reported depressive symptoms ^{a,c,d}	.05	.15 [†]	.20*	.17*
Family stress				
Life stressors in the past 12 months ^{a,c}	.14 [†]	.13	.18*	.20*
Marital adjustment ^{a,c}	.04	-.21*	-.16 [†]	-.13

Note: PSIS = Parent–Child Sleep Interactions Scale.

[†] $p < .10$.* $p < .05$.** $p < .01$.*** $p < .001$.^a Remained significant after Benjamini and Hochberg's [32] procedure to correct for multiple comparisons within domains was employed; all adjusted $p < .04$.^b Point biserial correlation coefficients.^c Pearson correlation coefficients.^d Assessed using the Diagnostic Inventory for Depression (DID).

4.1. Observed parenting behaviors

As expected, we observed significant associations between PSIS scores and problematic parenting behaviors. Specifically, in bivariate analyses, we found associations between PSIS total scores and higher observed parental intrusiveness and lower observed quality of instruction. In terms of the PSIS subscales, higher Sleep Conflict scores correlated negatively with observed parental quality of instruction, suggesting that at least some nighttime conflict may be created or exacerbated by bedtime rules and routines that

are ambiguous or mismatched to a child's developmental level. We also found that the Sleep Dependence subscale was positively associated with observed parental intrusiveness and negatively associated with observed parental support and quality of instruction. Collectively, these results suggest that although some amount of parental involvement in preschoolers' sleep routines is essential, over-involvement may interfere with a child's self-regulatory nighttime skills.

It is also noteworthy that we did not observe an association between PSIS scores and parental hostility. This finding was

Table 5

Correlations between the Parent–Child Sleep Interactions Scale and child psychopathology and functioning.

	PSIS scales			
	Sleep Reinforcement	Sleep Conflict	Sleep Dependence	PSIS total
Child psychopathology and functioning				
PAPA depressive symptoms ^a	.19*	.31***	.18*	.28***
PAPA anxiety symptoms ^a	.15 [†]	.37***	.09	.24**
PAPA ADHD symptoms ^a	.03	.23**	.06	.12
PAPA ODD symptoms ^a	-.11	.26**	.15 [†]	.15 [†]
PAPA impairment ratings	-.07	.19*	.08	.07
CGAS ^a	.02	-.28***	-.07	-.12

Note: Values represent zero-order Pearson correlation coefficients. PAPA = Preschool Age Psychiatric Assessment; CGAS = Children's Global Assessment of Functioning.

[†] $p < .10$.* $p < .05$.** $p < .01$.*** $p < .001$.^a Remained significant after Benjamini and Hochberg's [32] procedure to correct for multiple comparisons within domains was employed; all adjusted $p < .04$.

Table 6
Multivariate analyses: unique correlates of the Parent–Child Sleep Interactions Scale.

	b (SE)	pr	β
<i>PSIS Sleep Reinforcement correlates</i>			
Parent-reported PSDQ authoritative	.21 (.05)	.32	.32***
PAPA depressive symptoms	.29 (.13)	.18	.17*
<i>PSIS Sleep Conflict correlates</i>			
Observed parental quality of instruction	-.45 (.29)	-.14	-.13
Parent-reported PSDQ authoritative	-.08 (.04)	-.19	-.17*
Parent-reported PSDQ permissive	.11 (.08)	.12	.11
Marital adjustment	-.01 (.01)	-.11	-.10
PAPA depressive symptoms	.31 (.14)	.20	.24*
PAPA anxiety symptoms	.11 (.04)	.28	.31**
PAPA ADHD symptoms	.05 (.08)	.05	.05
PAPA ODD symptoms	.16 (.12)	.12	.15
PAPA impairment ratings	-.91 (.68)	-.12	-.15
CGAS	.02 (.03)	.06	.09
<i>PSIS Sleep Dependence correlates</i>			
Observed parental support	.42 (.65)	.05	.08
Observed parental intrusiveness	.01 (.77)	.001	.001
Observed parental quality of instruction	-1.18 (.66)	-.15	-.26
Parent-reported PSDQ authoritarian	-.001 (.08)	-.002	-.002
Parent-reported PSDQ permissive	.39 (.10)	.32	.32***
Life stressors in the past 12 months	.07 (.18)	.03	.03
Maternal depressive and/or anxiety disorder	.92 (.68)	.11	.11
Parent self-reported depressive symptoms	.07 (.04)	.12	.12
PAPA depressive symptoms	.12 (.12)	.08	.08
<i>PSIS total correlates</i>			
Observed parental intrusiveness	-.56 (1.74)	-.03	-.03
Observed parental quality of instruction	-2.24 (1.04)	-.18	-.22*
Parent-reported PSDQ permissive	.56 (.21)	.22	.21**
Life stressors in the past 12 months	.24 (.40)	.05	.05
Parent self-reported depressive symptoms	.10 (.10)	.09	.08
PAPA depressive symptoms	.58 (.28)	.17	.17*
PAPA anxiety symptoms	.11 (.09)	.10	.10

Note: PSIS = Parent–Child Sleep Interactions Scale; PSDQ = Parenting Styles and Dimensions Questionnaire; PAPA = Preschool Age Psychiatric Assessment; CGAS = Children's Global Assessment of Functioning.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

somewhat unexpected since parental hostility has been linked to child sleep problems [10,34]; though, there are limited data to elucidate this relationship. It is possible that this finding reflects an attenuated effect due to the observational nature of the laboratory-based parent–child interaction task. This unexpected finding underscores the importance of continued research utilizing observational measures to examine parenting and child sleep problems.

4.2. Perceived parenting styles

We found that PSIS total, Sleep Dependence, and Sleep Conflict subscale scores were positively associated with permissive parenting as assessed by parent self-report. In addition, the Sleep Conflict subscale was associated with less authoritative parenting (ie, high control and high warmth), and the Sleep Dependence subscale was positively associated with more authoritarian parenting (ie, high control and low warmth). Our findings are consistent with previous research linking parenting behaviors/styles characterized by less sensitivity, over-involvement, and lack of structure to children's sleep disruption [10]. Moreover, permissive parenting emerged as a unique predictor in multivariate models, further highlighting the importance of consistency, structure, and limit setting in promoting children's independent sleep regulation.

Contrary to our hypotheses, the Sleep Reinforcement subscale, a measure of parental reassurance and reinforcement of preschoolers' sleep behaviors, was associated with more authoritative parenting which remained significant in the multivariate analysis.

Nevertheless, higher levels of parental warmth and nighttime involvement have been linked to sleep problems in young children [10]. Indeed, increased parental involvement and soothing behaviors have been concurrently and prospectively linked to greater sleep problems in infancy and early childhood; it is hypothesized that these factors may increase children's ongoing need for nighttime parental involvement and reassurance, thus interfering with children's development of their own self-regulatory/self-soothing sleep skills [35]. By contrast, less parental involvement and soothing has been linked to longer and more consolidated sleep and increased ability of offspring to self-soothe [36]. Taken together, our data are in line with the broader literature suggesting that there is a necessary balance between parental sensitivity and responsiveness, limit setting, and parental involvement in promoting children's developing self-regulation and soothing skills. The preschool years in particular may reflect a critical developmental period for the emergence of such skills.

4.3. Maternal psychopathology and family stress

We found significant bivariate associations between the PSIS total score and greater maternal current depressive symptoms; in addition, we found that Sleep Dependence subscale scores were associated with greater current maternal depressive and anxiety disorders, and current depressive symptoms. These significant bivariate associations did not remain significant in multivariate models, however. In addition, we did not observe associations with Sleep Reinforcement. Our findings are nonetheless consistent with previous studies linking parental depression and anxiety to sleep disruption in offspring, and extend previous research linking maternal psychopathology to parenting behaviors that do not promote children's sleep [14,36]. For example, Warren et al. [14] found that maternal anxiety was associated with parenting behaviors that promoted sleep disruption and nighttime waking in offspring, such as lower rates of putting offspring to bed awake and higher rates of bedtime feedings. However, it remains unknown whether parental depression/anxiety in and of itself impairs nighttime parenting or whether greater overall levels of functional impairment (eg, disorganization or lower frustration tolerance) make it difficult for parents to utilize consistent limit setting strategies when putting children to sleep.

Importantly, the causal nature of the associations between parent psychopathology and parenting behaviors and interactions related to children's sleep cannot be determined from our data. Thus, given that higher rates of sleep disruption have been found in infants of parents with a history of depression and anxiety, an alternative explanation is that sleep disruption may be an inherent, early marker of risk for psychopathology in high-risk offspring [37].

Although indices of family stress did not contribute unique variance in the multivariate models, bivariate analyses showed that PSIS total and Sleep Dependence scores were associated with increased life stressors, and Sleep Conflict scores were associated with lower marital satisfaction. Research suggests that children's sleep problems negatively impact the family environment and heighten family stress and parental discord [38]. Alternatively, from an evolutionary psychology standpoint, it is possible that a home environment characterized by heightened marital and family stress may disrupt the necessary sense of security essential for efficient sleep/wake transitions [39,40]. Nevertheless, directionality should not be assumed: these complex associations remain poorly understood, and further work is needed to understand the causality or directionality of these associations and how they contribute to young children's sleep problems.

4.4. Child psychopathology and functioning

Lastly, we examined associations between PSIS total and subscale scores and child psychiatric symptoms and impairment. PSIS total scores were associated with greater depressive and anxiety symptoms; only depressive symptoms remained significant in the multivariate model. The Sleep Reinforcement and Sleep Dependence subscales were associated with depressive symptoms, which remained significant in the multivariate model for Sleep Reinforcement only. Excessive reassurance seeking is indeed common in depressed youth and may manifest in relation to sleep as well as waking behaviors. Notably, although the Sleep Conflict subscale was associated with depressive, anxiety, ADHD and ODD symptoms and greater functional impairment, the association with PAPA impairment ratings became significant at the trend level (adjusted $p = .05$) after correcting for multiple comparisons, and only depressive and anxiety symptoms remained significant in the multivariate model.

These collective findings are consistent with a considerable literature documenting associations between children's sleep problems and emotional and behavioral functioning (for a review, see Ref. [20]). These relationships presumably involve a complex interplay between parent, child, and environmental factors; for example, it is possible that children with greater emotional and behavioral difficulties may suffer from more intrinsically dysregulated sleep/wake patterns, which may evoke negative parenting behaviors or contribute to impairment in family functioning. Alternatively, negative parenting behaviors and family conflict may contribute to and sustain children's sleep disturbance over time, which in turn may be symptomatically linked to daytime emotional problems [6].

Interestingly, depressive and/or anxiety symptoms emerged as unique correlates in multivariate models, whereas ADHD and ODD symptoms did not. An intrinsic link between sleep and affective dysregulation is well documented in the experimental sleep literature, and sleep, arousal, and affect are recognized as overlapping regulatory systems [6]. Thus, our data build upon the growing body of literature documenting the robust associations between children's sleep and depressive and anxiety problems (for a review, see Ref. [20]), and provide further evidence for the validity of the PSIS as a measure of parenting behaviors and interactions related to sleep in young children.

4.4.1. Strengths and limitations

The present study had several methodological strengths, including a multi-method assessment of parenting incorporating data from both observational and parent-reported measures, and the use of semi-structured clinical interviews to assess parent and child psychopathology. In addition, we used a racially and ethnically diverse sample of preschoolers, which may permit greater generalizability of the PSIS.

The present study also had several limitations. First, the study was cross-sectional; thus, we are unable to infer causality or directionality. Second, we used parent-reports for the PSIS and for several other measures in the study (eg, life stress, child psychopathology, and functioning). It would have been preferable to incorporate data from multiple informants/sources to minimize shared method variance. Third, parent-child sleep interactions and behaviors were based on parent reports, which may be subject to parental and retrospective bias. Moreover, as associations between the PSIS and children's actual sleep patterns remain unknown, research utilizing other sleep measures is needed to establish the convergent validity of the PSIS with objective sleep patterns (eg, actigraphy, direct observations of bedtime routines). Fourth, while the observational nature of the parenting assessment is a strength, the range scores for some observational variables

(eg, parental hostility and parental intrusiveness) were somewhat restricted, possibly attenuating associations. Still, significant associations were observed even with small variations in observed parental intrusiveness. Fifth, the sample was largely middle class, and parents were in their mid-30s and had high levels of education. Future studies should examine the PSIS in more socio-economically diverse samples. In closing, our findings expand upon previous evidence for the PSIS as a valid measure of parenting behaviors and interactions related to sleep in young children, and underscore the importance of considering parenting and family context in the development and maintenance of children's sleep problems. Our findings are also noteworthy given the paucity of research on sleep in young children and the limited availability of measures assessing the role of sleep-related parenting behaviors and interactions in children's sleep difficulties. Although further research is needed to demonstrate the utility of the PSIS across different settings and populations, the PSIS shows considerable promise as a brief, valid, and reliable measure for assessing parent behaviors and interactions that may lead to and/or maintain sleep-related problems in young children. In research settings, the PSIS may assist in delineating mechanisms of risk for early childhood sleep problems, while in clinical settings the PSIS may assist in identifying young children who may benefit from behavioral sleep interventions, and may also hold utility in tracking intervention progress. Importantly, our results highlight that increased clinical and scientific examination of sleep problems in early childhood is warranted. New instruments such as the PSIS which focus on sleep in young children may help promote early intervention and prevention at a critical developmental period.

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Conflict of interest

The ICMJE Uniform Disclosure Form for Potential Conflicts of Interest associated with this article can be viewed by clicking on the following link: <http://dx.doi.org/10.1016/j.sleep.2014.04.002>.

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